IN THE CLAIMS:

Please amend the claims as follows:

1. (Currently amended) A method for tracking a pilot channel signal to discipline an oscillator, comprising:

downconverting an RF signal from a RF center frequency f_{RF} to an intermediate center frequency f_L where f_L is greater than or equal to a chip rate f_c, wherein downconverting includes incorporating bandpass filtering to remove extraneous signals while passing said pilot channel signal;

converting a signal format from analog to digital using a single analog-to-digital converter employing a sampling rate of f_s to create a digital signal $\{s(n)\}$;

employing a correlation circuit to establish a correlation between {s(n)} and locally generated versions of I-channel and Q-channel PN signals, $\{I_{PN}(n)\}$ and $\{Q_{PN}(n)\}$, respectively; ~~and~~

generating an estimate of a frequency error of the oscillator using correlation values corresponding to (2M+1) time shifts of $\{I_{PN}(n)\}$ and $\{Q_{PN}(n)\}$, the (2M+1) time shifts being $K-\Delta_M$, $K-\Delta_{(M-1)}$, . . . , $K-\Delta_2$, $K-\Delta_1$, K, and $K+\Delta_1$, $K+\Delta_2$, . . . , $K+\Delta_{(M-1)}$, $K+\Delta_M$, where a time shift of K corresponds to a time shift that provides a maximum correlation value, and M is greater than or equal to 1; and

disciplining the oscillator using the estimate of the frequency error of the oscillator,

wherein correlation values between the digital signal {s(n)} and at least one locally generated version of I-channel and Q-channel PN signals $\{I_{PN}(n)\}$ and $\{Q_{PN}(n)\}$ are averaged over multiple periods of the PN signals to improve a quality of pilot position estimation.

2. (Original) The method of claim 1, wherein the sampling rate, f_s, the intermediate

center frequency, f_L, and the chip rate f_c, are related by $f_s=4f_c$, and $f_L=f_c+kf_s$ for k=0.

3. (Original) The method of claim 1, wherein the sampling rate, f_s, the intermediate center frequency, f_L, and the chip rate f_c, are related by $f_s=4f_c$, and $f_L=f_c+kf_s$ for k=1.

4. (Original) The method of claim 1, wherein the sampling rate, f_s, the intermediate center frequency, f_L, and the chip rate f_c, are related by $f_s=4f_c$, and $f_L=f_c+kf_s$ for k=2.

5. (Previously Presented) The method of claim 1, wherein the correlation circuit uses a single accumulator for generating both an in-phase ("real") part and a quadrature ("imaginary") part of a complex correlation between the digital signal $\{s(n)\}$ and a given time shifted version of the locally generated versions of $\{I_{PN}(n)\}$ and $\{Q_{PN}(n)\}$.

6. (Original) The method of claim 5, wherein both positive overflows and negative underflows are monitored.

7. (Original) The method of claim 1, wherein a matched filter is not employed.

8. (Canceled)

9. (Previously Presented) The method of claim 1, wherein correlations are computed at time shift lags which are commensurate with the sampling rate.

10. (Previously Presented) The method of claim 9, wherein correlations for lags smaller than the sampling interval are synthesized using a digital signal processing.

11. (Canceled)

12. (Previously Presented) The method of claim 1, further comprising computing correlations over a period less than the time period of the PN signals using an autonomous background correlator.

13. (Canceled)

14. (Currently amended) An apparatus to track a pilot signal <u>to discipline an oscillator</u>, comprising:

a correlator circuit adapted to compute a complex correlation between a received version of the pilot signal and locally generated versions of I-channel and Q-channel PN signals, $\{I_{PN}(n)\}$ and $\{Q_{PN}(n)\}$, respectively; and

a signal processor circuit coupled to the correlator circuit,

wherein the signal processor circuit <u>disciplines the oscillator and</u> averages correlation values between the received version of the pilot signal and at least one locally generated version of I-channel and Q-channel PN signals $\{I_{PN}(n)\}$ and $\{Q_{PN}(n)\}$ over multiple periods of the PN signals<u> to improve a quality of pilot position estimation</u>.

15. (Original) The apparatus of claim 14, wherein said correlator circuit includes an FPGA.

16. (Original) The apparatus of claim 14, wherein the correlator circuit includes a single accumulator that computes both the real and imaginary part of the complex correlation.

17. (Canceled)

18. (Previously Presented) The apparatus of claim 14, wherein said signal processor circuit includes a DSP.

19. (Canceled)

20. (Previously Presented) A receiver including two of the apparatus according to claim 14 that are operated in parallel to track multiple pilots.

21. (Original) The receiver of claim 20, wherein at least one correlator computes correlation values over a time period of less than one period of the PN signals and is used as an autonomous background correlator.

22. (Canceled)

23. (Currently amended) A method for tracking a pilot channel to discipline an oscillator, comprising:

downconverting the RF signal from the RF center frequency, f_{RF} to an intermediate center frequency of f_L, where f_L is greater than or equal to the chip rate, f_c, said downconversion incorporating bandpass filtering to remove extraneous signals while passing said pilot channel signal;

converting signal format from analog to digital using a single analog-to-digital converter employing a sampling rate of f_s, to create the digital signal $\{s(n)\}$;

employing correlation to establish the correlation between {s(n)} and locally generated versions of I-channel and Q-channel PN signals, $\{I_{PN}(n)\}$ and $\{Q_{PN}(n)\}$, respectively; ~~and~~

generating an estimate of the frequency error of the oscillator using correlation values corresponding to (2M+1) time shifts of the locally generated versions of $\{I_{PN}(n)\}$ and $\{Q_{PN}(n)\}$, said time shifts being $K-\Delta_M$, $K-\Delta_{(M-1)}$, . . . , $K-\Delta_2$, $K-\Delta_1$, K, and $K+\Delta_1$, $K+\Delta_2$, . . . , $K+\Delta_{(M-1)}$, $K+\Delta_M$, where time shift of K corresponds to the time shift that provides a ~~the~~ maximum correlation value, and the value of M is 4; and

disciplining the oscillator using the estimate of the frequency error of the oscillator,

wherein correlation values between the digital signal {s(n)} and at least one locally generated version of I-channel and Q-channel PN signals $\{I_{PN}(n)\}$ and $\{Q_{PN}(n)\}$ are averaged over multiple periods of the PN signals to improve a quality of pilot position estimation.

24. (Currently amended) A method of tracking a pilot channel to discipline an oscillator, comprising:

disciplining an oscillator including generating a spectrum shaped channel pilot signal $\{\gamma(n)\}$ from a chip-rate PN sequence $\{i(n)\}$ by:

oversampling the chip-rate PN sequence $\{i(n)\}$ at a higher sampling rate to yield a signal $\{a(n)\}$;

passing $\{a(n)\}$ through a first FIR filter whose impulse response coefficients are $\{g(n)\}$ to yield a signal $\{\vartheta(n)\}$; and

filtering $\{\vartheta(n)\}$ with a second FIR filter to yield the spectrum shaped channel pilot signal $\{\gamma(n)\}$; and

averaging correlation values between the signal $\{a(n)\}$ and the spectrum shaped channel pilot signal $\{\gamma(n)\}$ over multiple periods of the chip-rate PN sequence to improve a quality of pilot position estimation.

25. (Original) The method of claim 24, wherein the spectrum shaped channel pilot signal $\{\gamma(n)\}$ is a spectrum shaped I-channel pilot signal.

26. (Original) The method of claim 24, wherein both positive overflows and negative overflows are monitored.

27. (Original) The method of claim 24, further comprising translating the spectrum shaped I channel pilot signal $\{\gamma(n)\}$ down to a zero-offset-carrier frequency signal $\{s(n)\}$.

28. (Original) The method of claim 27, further comprising translating the zero-offset-carrier frequency signal $\{s(n)\}$ down to a baseband signal $\{w(n)\}$.

29. (Original) The method of claim 24, wherein a sampling clock is derived from a VCXO that is phase-locked to a reference frequency.

30. (Original) The method of claim 24, wherein a correlation is computed at lags which are commensurate with a sampling rate.

31. (Original) The method of claim 24, wherein a matched filter is not employed.

32. (Canceled)

33. (Previously Presented) The method of claim 24, wherein the spectrum shaped channel pilot signal $\{\gamma(n)\}$ is a spectrum shaped Q-channel pilot signal.

34. (Currently amended) An apparatus to track a pilot signal to discipline an oscillator, comprising:

a correlator circuit adapted to oversample a chip-rate PN sequence $\{i(n)\}$ at a higher sampling rate to yield a signal $\{a(n)\}$, pass $\{a(n)\}$ through a first FIR filter whose impulse response coefficients are $\{g(n)\}$ to yield a signal $\{\vartheta(n)\}$; and filter $\{\vartheta(n)\}$ with a second FIR filter to yield a spectrum shaped pilot channel signal $\{\gamma(n)\}$; and

a signal processor circuit coupled to the correlator circuit,

wherein the signal processor circuit disciplines the oscillator and averages correlation values between the signal $\{a(n)\}$ and the spectrum shaped channel pilot signal $\{\gamma(n)\}$ over multiple periods of the chip-rate PN sequence to improve a quality of pilot position estimation.

35. (Previously Presented) The apparatus of claim 34, wherein said correlator circuit includes a FPGA.

36. (Canceled)

37. (Original) The apparatus of claim 34, wherein said signal processor circuit includes a DSP.

38. (Previously Presented) The apparatus of claim 34, further comprising an A/D converter coupled to said signal processor circuit.

39. (Previously Presented) The apparatus of claim 34, wherein the first FIR filter includes a 4-point FIR filter having all 4 coefficients at least substantially equal.

40. (Previously Presented) The apparatus of claim 34, wherein the second FIR filter includes a 48-point FIR filter.

41. (Canceled)

42. (Previously Presented) The apparatus of claim 34, further comprising an autonomous background correlator coupled to the correlator circuit.

43. (Previously Presented) A receiver comprising at least two of the apparatus according to claim 34 that are operated in parallel to track multiple pilots.

44. (Previously Presented) The method of claim 1, wherein averaging includes averaging C_{MS} over multiple correlation computations to reduce noise

45. (Previously Presented) The apparatus of claim 14, wherein the signal processor averages C_{MS} over multiple correlation computations to reduce noise.

46. (Previously Presented) The method of claim 24, wherein averaging includes averaging C_{MS} over multiple correlation computations to reduce noise.

47. (Previously Presented) The apparatus of claim 34, wherein the signal processor averages C_{MS} over multiple correlation computations to reduce noise.

48. (Previously Presented) The method of claim 10, wherein using digital signal processing includes synthesizing an offset to improve precision of an estimate of time-of-arrival

of a received pilot code.

49. (Previously Presented) The apparatus of claim 18, wherein the DSP synthesizes an offset to improve precision of an estimate of time-of-arrival of a received pilot code.

50. (Previously Presented) The method of claim 24, wherein correlations for lags smaller than the sampling interval are synthesized using digital signal processing.

51. (Previously Presented) The method of claim 50, wherein using digital signal processing includes synthesizing an offset to improve precision of an estimate of time-of-arrival of a received pilot code.

52. (Previously Presented) The apparatus of claim 34, wherein the DSP synthesizes an offset to improve precision of an estimate of time-of-arrival of a received pilot code.

53. (Previously Presented) The method of claim 1, further comprising employing another correlator circuit in parallel to track multiple pilots.

54. (Previously Presented) The method of claim 24, further comprising disciplining another oscillator in parallel to track multiple pilots including generating another spectrum shaped channel pilot signal by:

oversampling to yield another signal;

passing the another signal through another FIR filter; and

filtering with another second FIR filter to yield the another spectrum shaped channel pilot signal.

55. (Previously Presented) The method of claim 1, wherein the correlation circuit is time shared to track multiple pilots.

56. (Previously Presented) The apparatus of claim 14, wherein the correlator circuit is time shared to track multiple pilots.

57. (Previously Presented) The method of claim 24, further comprising time sharing a correlator circuit to track multiple pilots.

58. (Previously Presented) The apparatus of claim 34, wherein the correlator circuit is time shared to track multiple pilots.

59. (Previously Presented) The method of claim 1, wherein the I-channel and Q-channel PN signals are different.

60. (Previously Presented) The apparatus of claim 14, wherein the I-channel and Q-channel PN signals are different.

61. (Previously Presented) The method of claim 24, wherein disciplining an oscillator includes generating another spectrum shaped channel pilot signal from another different chip-rate PN sequence.

62. (Previously Presented) The apparatus of claim 34, wherein the correlator circuit adapted to oversample another different chip-rate PN sequence.